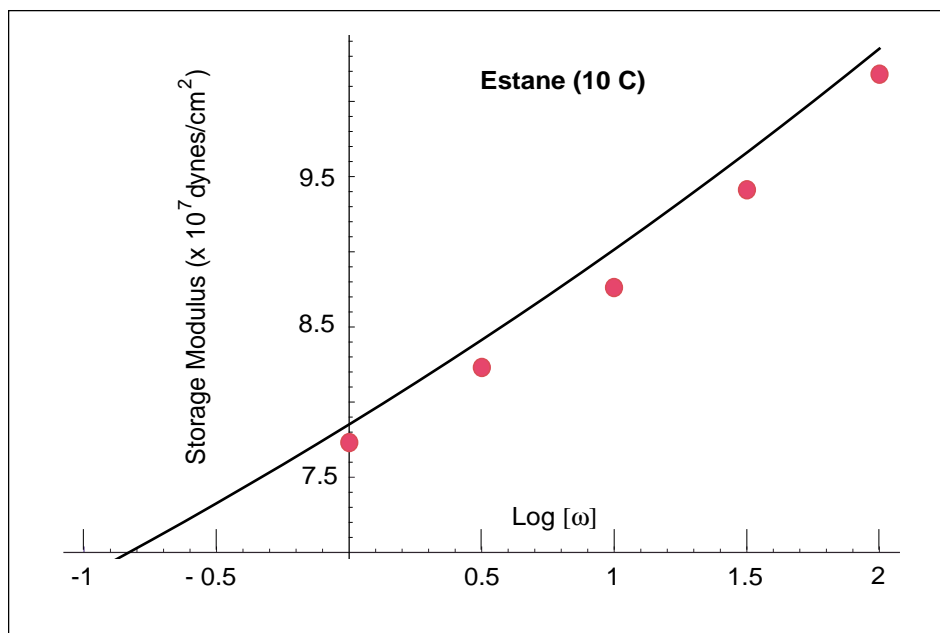


## Viscoelasticity of Estane

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Estane, a random copolymer, is one of the two main constituents of a binder used to make insensitive high explosives. As such, it is important to understand how its mechanical properties are affected as it ages under various forms of attack. Two years ago, I developed a gauge theory to study the self-assembly which occurs in estane (*Phys. Rev. E* **57** 1921, 1998). The original static theory has now been extended to understand the dynamics of estane. This extension has been done with the aid of viscoelasticity experiments performed in MST Division. Currently, the

theory provides results which match reasonably well with experiments (see attached figure). Computations are under way to understand the dependence of the theory on the molecular weights of the chains that make up estane. This shall shed light on the aging properties of estane. Our future plans are to extend this linear theory to treat finite extensions. In turn, this will allow us to understand the response of estane, starting from a relatively basic level, to strong impacts such as shock-wave loading.



**Figure:** The red circles denote experimental measurements of the storage modulus of Estane at 10 Celsius. The solid line indicates the theoretical fit.

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**The original static theory has now been extended  
to understand the dynamics of estane.**

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